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Commentary: Use of a deprogramming appliance in obtaining centric relation records

Richard P. McLaughlin, DDS

Most orthodontists believe it is important to obtain records and evaluate cases with the condyles in centric relation (i.e., seated upward and forward and centered transversely). The technique for doing this, however, has been controversial in orthodontics for many years. Many orthodontists believe they can obtain centric relation and correctly diagnose cases using a wax bite and unmounted (hand-held) study models. Others believe it is necessary to take centric relation wax bites and mount study models on an articulator in order to detect differences between centric occlusion (maximum intercuspation) and centric relation. More specifically, they believe that significant centric occlusion (CO)—centric relation (CR) discrepancies may go undetected unless they mount all cases on an articulator.

The article by Karl and Foley addresses the subject of articulator mountings and provides an interesting basis for further discussion. The authors mounted study models of 40 TMD-free subjects on articulators and recorded CO-CR differences (referred to as CO-CRJ). They concluded that overnight use of a Lucia jig deprogramming appliance is beneficial in deprogramming the muscles and obtaining more accurate centric relation recordings. However, while statistically significant results were achieved in the study, the conclusion that the Lucia jig technique is of practical clinical value is questionable.

It has been well documented that 80% to 90% of orthodontic patients have discrepancies of 2 mm or less between centric occlusion and centric relation. Approximately 10% to 20% of orthodontic patients have CO-CR discrepancies greater than 2 mm, and it is in this group that difficulties in recording centric relation are usually encountered.

In this study, overbite was reduced an average of 1.58 mm (75%) with the CR recording, and an additional 0.65 mm (25%) after overnight use of the Lucia jig (CRJ). This is the largest change in the study between CR and CRJ. However, is 0.65 mm clinically significant in diagnosis and treatment planning and worth this additional effort, as the authors contend? This is not to say that the deprogramming appliance would not be of benefit in revealing additional changes from maximum intercuspation in cases that have CO-CR discrepancies greater than 2 mm (especially when CR is difficult to record due to muscle tightness).

Overjet increase was clinically insignificant in both situations, with increases of 0.44 mm in CR and 0.13 mm after CRJ. The change in the average horizontal condylar position measured on the CPI instrument was 1.17 mm with the CR recordings, but only an additional 0.37 mm after the CRJ recordings. The average vertical condylar change was 1.19 mm with the original CR recording, but only an additional 0.57 mm after the CRJ recording. The transverse condylar change was 0.45 mm after the initial CR recording, and only an additional 0.06 mm after the CRJ recording.

Thus, while the change after CR recordings was at times clinically significant, the change after CRJ recording was not. And even when the percentage seemed to change significantly, the millimeters of change were probably clinically insignificant.

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Another potential difficulty of the

study was the relatively short time the Lucia jig was worn. Six hours may not have been adequate to properly deprogram the musculature and reveal the maximum amount of change that could occur. With patients whose centric relation recording is difficult to obtain (in particular, those with temporomandibular disorders) it has been traditionally recommended that a deprogramming splint be used to relax the muscles, heal the temporomandibular joints, and allow for an accurate recording of centric relation. Changes in mandibular position can continue to occur well beyond 6 hours. Muscle deprogramming may take up to 10 to 14 weeks, and splint therapy may continue for 6 months or more to allow for complete stabilization and joint healing.

The majority of patients in the study showed a minimal CO-CR discrepancy. Gnathologists contend that it is not the 80% to 90% of cases with minimal CO-CR discrepancies that will benefit from study-model mounting, but rather the 10% to 20% of patients who have more significant CO-CR discrepancies. While this article serves as a valuable baseline study, a second study evaluating patients with the "worst-case scenario" may reveal the value of the Lucia jig technique.

This new study should include only patients with CO-CR discrepancies greater than 2 mm. Patients with TMJ dysfunction should not be excluded, as they may demonstrate significant discrepancies between CO and CR. The new study would demonstrate any additional CO-CR discrepancy detected with overnight wear of the Lucia jig. This could prove to be clinically significant and hence warrant the use in these patients when centric relation is difficult to obtain.

One might conclude from the preceding comments that this commentator is opposed to the mounting of orthodontic cases on an articulator. In fact, I have mounted models for every patient I've seen over the last 14 years. Mounting orthodontic study models on an articulator prior to diagnosis and treatment planning offers the following advantages:

1. Mounted study models reveal anteroposterior changes in the dentition between CO and CR. (Hand-held models, if correctly trimmed could reveal the same discrepancies.)
2. Mounted study models reveal vertical discrepancies, such as molar fulcrumming problems, as the condyles seat in the fossa. (When the wax bite is removed from hand-held models for review, the anterior teeth frequently come together, masking these interferences.)
3. Mounted study models reveal cants to the occlusal plane (often missed with hand-held models).
4. Mounted study models uncover functional side shifts of the mandible. (When the wax bite is removed from hand-held models, they may slide laterally into a different position, masking the true CR position.)
5. Mounted study models might reveal premature anterior contacts with lack of contact posteriorly. (Hand-held models may fall together posteriorly when the wax bite is removed, and this prematurity may be missed.)
6. Mounted study models may reveal unilateral prematurities with lack of contact on the opposing side. (Hand-held models may fall together on both sides when the wax bite is removed for evaluation.)
7. Mounted study models require only a small additional amount of chair time (for the facebow recording).
8. The mounting of study models on an articulator is cost-effective in that the cost of providing reasonably well-trimmed articulator mounted models is less than the cost of finely polished hand-held models. The initial cost of the articulators is significant, but is soon absorbed in the savings on the study model mountings.

At a time when the orthodontic specialty is concerned about quality orthodontic treatment, orthodontists should demonstrate their commitment to the highest quality of care for their patients. While it is clear that the majority of orthodontic cases can be diagnosed with hand-held models, a well-documented minority of cases may be misdiagnosed due to undetected CO-CR discrepancies. The mounting of study models does not in and of itself make one a good orthodontist, but it can be a valuable part of achieving that goal.